


FM 20-3
30 AUGUST 1999

By Order of the Secretary of the Army:

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DISTRIBUTION:

Active Army, Army National Guard, and U. S. Army Reserve: To be distributed in accordance with the initial distribution number 114825, requirements for FM 20-3.

Preface

This field manual (FM) is intended to help company-level leaders understand the principles and techniques of camouflage, concealment, and decoys (CCD). To remain viable, all units must apply CCD to personnel and equipment. Ignoring a threat's ability to detect friendly operations on the battlefield is shortsighted and dangerous. Friendly units enhance their survivability capabilities if they are well versed in CCD principles and techniques.

CCD is equal in importance to marksmanship, maneuver, and mission. It is an integral part of a soldier's duty. CCD encompasses individual and unit efforts such as movement, light, and noise discipline; litter control; dispersal; and deception operations. Each soldier's actions must contribute to the unit's overall CCD posture to maximize effectiveness.

Increased survivability is the goal of a CCD plan. A unit commander must encourage each soldier to think of survivability and CCD as synonymous terms. Training soldiers to recognize this correlation instills a greater appreciation of CCD values.

A metric conversion chart is provided in [Appendix A](#).

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This publication implements Standardization Agreement [\(STANAG\) 2931](#), *Orders for the Camouflage of the Red Cross and Red Crescent on Land in Tactical Operations*.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

Field Manual
No. 20-3

Headquarters
Department of the Army
Washington, DC, 30 August 1999

FM 20-3
CAMOUFLAGE, CONCEALMENT, AND DECOYS

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DISTRIBUTION RESTRICTION: Approved for public release; distribution is unlimited.

*This publication supersedes FM 20-3, 14 November 1990.

Chapter 1

Basics

CCD is the use of materials and techniques to hide, blend, disguise, decoy, or disrupt the appearance of military targets and/or their backgrounds. CCD helps prevent an enemy from detecting or identifying friendly troops, equipment, activities, or installations. Properly designed CCD techniques take advantage of the immediate environment and natural and artificial materials. One of the imperatives of current military doctrine is to conserve friendly strength for decisive action. Such conservation is aided through sound operations security (OPSEC) and protection from attack. Protection includes all actions that make soldiers, equipment, and units difficult to locate.

DOCTRINAL CONSIDERATIONS

1-1. CCD degrades the effectiveness of enemy reconnaissance, surveillance, and target-acquisition (RSTA) capabilities. Skilled observers and sophisticated sensors can be defeated by obscuring telltale signs (signatures) of units on the battlefield. Preventing detection impairs enemy efforts to assess friendly operational patterns, functions, and capabilities.

1-2. CCD enhances friendly survivability by reducing an enemy's ability to detect, identify, and engage friendly elements. Survivability encompasses all actions taken to conserve personnel, facilities, and supplies from the effects of enemy weapons and actions. Survivability techniques include using physical measures such as fighting and protective positions; nuclear, biological, chemical (NBC) equipment; and armor. These actions include interrelated tactical countermeasures such as dispersion, movement techniques, OPSEC, communications security (COMSEC), CCD, and smoke operations (a form of CCD). Improved survivability from CCD is not restricted to combat operations. Benefits are also derived by denying an enemy the collection of information about friendly forces during peacetime.

1-3. Deception helps mask the real intent of primary combat operations and aids in achieving surprise. Deception countermeasures can delay effective enemy reaction by disguising information about friendly intentions, capabilities, objectives, and locations of vulnerable units and facilities. Conversely, intentionally poor CCD can project misleading information about friendly operations. Successful tactical deception depends on stringent OPSEC.

1-4. Smoke and obscurants are effective CCD tools and greatly enhance the effectiveness of other traditionally passive CCD techniques. Smoke and obscurants can change battlefield dynamics by blocking or degrading the spectral bands used by an enemy's target-acquisition and weapons systems. More recently developed obscurants are now able to degrade nonvisual detection systems such as thermal infrared (IR) imaging

systems, selected radar systems, and laser systems. (See [FM 3-50](#) for more information on planning smoke operations.)

RESPONSIBILITIES

1-5. Each soldier is responsible for camouflaging and concealing himself and his equipment. Practicing good CCD techniques lessens a soldier's probability of becoming a target. Additionally, a thorough knowledge of CCD and its guiding principles allows a soldier to easily recognize CCD as employed by an enemy.

1-6. A commander is responsible for CCD of his unit, and noncommissioned officers (NCOs) supervise well-disciplined soldiers in executing CCD. They use established standing operating procedures (SOPs) and battle drills to guide their efforts. CCD is a combat multiplier that should be exploited to the fullest extent.

1-7. An engineer is a battlefield expert on CCD. He integrates CCD into higher unit operations and advises commanders on all aspects of CCD employment as it relates to a unit's current mission.

PRIORITIES

1-8. Every soldier and military unit has an inherent mission of self-protection, and they should use all CCD means available. However, CCD countermeasures have become more complicated due to advancing technology. Commanders must recognize that advanced technologies have—

- Enhanced the performance of enemy recon and surveillance equipment.
- Increased an enemy's ability to use electromagnetic (EM) signature analysis for detecting friendly units.
- Reduced the time available to apply CCD because units must perform nearly all aspects of battlefield operations at an increased speed.

1-9. When time, camouflage materials, or other resources are insufficient to provide adequate support to units, commanders must prioritize CCD operations. Considerations for establishing these priorities involve analyzing the mission, enemy, terrain, weather, troops, time available, and civilian considerations (METT-TC). The following sets forth a METT-TC methodology to help determine CCD priorities:

- **Mission.** The mission is always the first and most important consideration. CCD efforts must enhance the mission but not be so elaborate that they hinder a unit's ability to accomplish the mission.
- **Enemy.** An enemy's RSTA capabilities often influence the camouflage materials and CCD techniques needed to support a unit's mission. Before beginning a

mission, conduct an intelligence analysis to identify the enemy's RSTA capabilities.

- Terrain and weather. The battlefield terrain generally dictates what CCD techniques and materials are necessary. Different terrain types or background environments (urban, mountain, forest, plains, desert, arctic) require specific CCD techniques. (See [Chapter 7](#) for more information.)
- Troops. Friendly troops must be well trained in CCD techniques that apply to their mission, unit, and equipment. A change in the environment or the mission often requires additional training on effective techniques. Leaders must also consider the alertness of troops. Careless CCD efforts are ineffective and may disclose a unit's location, degrade its survivability, and hamper its mission accomplishment. Intelligence analysis should address the relative detectability of friendly equipment and the target signatures that unit elements normally project.
- Time. Time is often a critical consideration. Elaborate CCD may not be practical in all tactical situations. The type and amount of CCD needed are impacted by the time a unit occupies a given area, the time available to employ CCD countermeasures, and the time necessary to remove and reemploy camouflage during unit relocation. Units should continue to improve and perfect CCD measures as time allows.
- Civilian considerations. From conflict to war and from tactical to strategic, civilians in the area of operation (AO) may be active or passive collectors of information. Commanders and their staffs should manage this collection capability to benefit the command and the mission.

TRAINING

1-10. CCD training must be included in every field exercise. Soldiers must be aware that an enemy can detect, identify, and acquire targets by using resources outside the visual portion of the EM spectrum.

INDIVIDUAL

1-11. Each member of the unit must acquire and maintain critical CCD skills. These include the ability to analyze and use terrain effectively; to select an individual site properly; and to hide, blend, disguise, disrupt, and decoy key signatures using natural and artificial materials.

CAUTION

Ensure that local environmental considerations are addressed before cutting live vegetation or foliage in training areas.

UNIT

1-12. Unit CCD training refines individual and leader skills, introduces the element of team coordination, and contributes to tactical realism. If CCD is to conserve friendly strength, it must be practiced with the highest degree of discipline. The deployment and teardown of camouflage; light, noise, and communications discipline; and signal security must be practiced and evaluated in an integrated mission-training environment. CCD proficiency is developed through practicing and incorporating lessons learned from exercises and operations. A unit must incorporate CCD (who, what, where, when, and how) into its tactical standing operating procedure (TACSOP). ([Appendix B](#) provides additional guidance on integrating CCD into a unit's field TACSOP.) Generally, CCD is additive and synergistic with other defensive measures. CCD enhances unit survivability and increases the likelihood of mission success. A unit that is well trained in CCD operations more easily recognizes CCD as employed by an enemy, and this recognition enhances a unit's lethality.

EVALUATION

1-13. CCD training should be realistic and integrated with a unit's training evaluations. Employ the following techniques to enhance training evaluations:

- Have small-unit leaders evaluate their unit's CCD efforts from an enemy's viewpoint. How a position looks from a few meters away is probably of little importance. Evaluators should consider the following:
 - Could an approaching enemy detect and place aimed fire on the position?
 - From what distance can an enemy detect the position?
 - Which CCD principle was ignored that allowed detection?
 - Which CCD technique increased the possibility of detection?
- Use binoculars or night-vision or thermal devices, when possible, to show a unit how it would appear to an enemy.
- Use photographs and videotapes, if available, of a unit's deployments and positions as a method of self-evaluation.
- Incorporate ground-surveillance-radar (GSR) teams in training when possible. Let the troops know how GSR works and have them try to defeat it.
- Request aerial multispectral (visual, IR, radar) imagery of friendly unit positions. This imagery shows how positions appear to enemy aerial recon. Unit leaders should try to obtain copies of opposing forces (OPFOR) cockpit heads-up display (HUD) or videotapes, which are excellent assessment tools for determining a unit's detectability from an enemy's perspective. Another valuable assessment tool is the overhead imagery of a unit's actions and positions. Overhead imagery is often difficult to obtain; but if a unit is participating in a large-scale exercise or

deployment, the imagery probably exists and can be accessed through the unit's intelligence channels.

- Use OPFOR to make training more realistic. Supporting aviation in an OPFOR role also helps. When possible, allow the OPFOR to participate in the after-action review (AAR) following each mission. The unit should determine what factors enabled the OPFOR to locate, identify, and engage the unit and what the unit could have done to reduce its detectability.

OTHER CONSIDERATIONS

1-14. Warfare often results in personnel losses from fratricide. Fratricide compels commanders to consider CCD's effect on unit recognition by friendly troops.

1-15. Army policy prescribes that camouflage aids be built into equipment and supplies as much as possible. Battle-dress uniforms (BDUs), paint, Lightweight Camouflage Screen systems (LCSSs), and decoys help achieve effective camouflage. These aids are effective only if properly integrated into an overall CCD plan that uses natural materials and terrain. During training exercises, ensure that cutting vegetation or foliage does not adversely effect the natural environment (coordinate with local authorities). CCD aids should not interfere with the battlefield performance of soldiers or equipment or the installations that they are designed to protect. (See [Appendix C](#) for more information on CSSs.)

1-16. When employed correctly, expedient CCD countermeasures are often the most effective means of confusing an enemy. Along with the standard items and materials listed above, soldiers can use battlefield by-products, construction materials, and indigenous or locally procurable items to enhance unit CCD posture. For example, a simple building decoy can be constructed with two-by-fours and plywood. With the addition of a heat source, such as a small charcoal pit, the decoy becomes an apparently functional building. However, as with all CCD countermeasures, ensure that expedient treatments project the desired signatures to the enemy and do not actually increase the unit's vulnerability to detection. Expedient CCD countermeasures are also beneficial because the enemy has less time to study and become familiar with the selected countermeasures.

Chapter 2

Threat

The enemy employs a variety of sensors to detect and identify US soldiers, equipment, and supporting installations. These sensors may be visual, near infrared (NIR), IR, ultraviolet (UV), acoustic, or multispectral/hyperspectral. They may be employed by dismounted soldiers or ground-, air-, or space-mounted platforms. Such platforms are often capable of supporting multiple sensors. Friendly troops rarely know the specific sensor systems or combination of systems that an enemy employs. When possible, friendly troops should protect against all known threat surveillance systems.

DOCTRINE

2-1. Many threat forces were trained and equipped by the former Soviet Union. Its long-standing battlefield doctrine of *maskirovka* is a living legacy in many former Soviet-client states. Maskirovka incorporates all elements of CCD and tactical battlefield deception into a cohesive and effective philosophy. During the Gulf War, Iraq used maskirovka to effectively maintain its capability of surface-to-surface missiles (Scuds) in the face of persistent coalition-force attacks. Enemy forces that are trained in maskirovka possess a strong fundamental knowledge of CCD principles and techniques. Friendly forces must be very careful to conduct CCD operations so that a well-trained enemy will not easily recognize them.

2-2. Typical threat doctrine states that each battalion will continuously maintain two observation posts when in close contact with its enemy. An additional observation post is established when the battalion is in the defense or is preparing for an offense.

2-3. Patrolling is used extensively, but particularly during offensive operations. Patrols are used to detect the location of enemy indirect- and direct-fire weapons, gaps in formations, obstacles, and bypasses.

2-4. Enemy forces use raids to capture prisoners, documents, weapons, and equipment. A recon-in-force (usually by a reinforced company or battalion) is the most likely tactic when other methods of tactical recon have failed. A recon-in-force is often a deceptive tactic designed to simulate an offensive and cause friendly forces to reveal defensive positions.

ORGANIZATION

2-5. A typical enemy force conducts recon activities at all echelons. A troop recon is usually conducted by specially trained units. The following types of enemy units might

have specific intelligence-collection missions:

- Troops. An enemy uses ordinary combat troops to perform recon. One company per battalion trains to conduct recon operations behind enemy lines.
- Motorized rifle and tank regiments. Each regiment has a recon company and a chemical recon platoon.
- Maneuver divisions. Divisions have a recon battalion, an engineer recon platoon, a chemical recon platoon, and a target-acquisition battery.

DATA COLLECTION

2-6. An enemy collects information about United States (US) forces for two basic reasons—target acquisition and intelligence production. Enemy weapons systems often have sensors that locate and identify targets at long ranges in precise detail. Soldiers and units should take actions to hinder the enemy's target-acquisition process. These actions include all practical CCD operations expected to reduce the identification of soldiers, units, and facilities.

2-7. An enemy uses sensor systems to locate and identify large Army formations and headquarters (HQ) and to predict their future activities. Enemy detection of rear-area activities, such as logistics centers and communications nodes, may also reveal friendly intentions.

2-8. An enemy uses tactical recon to provide additional information on US forces' dispositions and the terrain in which they are going to operate. The enemy's tactical recon also attempts to identify targets for later attack by long-range artillery, rockets, aircraft, and ground forces.

SENSOR SYSTEMS

2-9. An enemy uses many different types of electronic surveillance equipment. Sensor systems are classified according to the part of the EM spectrum in which they operate. [*Figure 2-1*](#) shows the EM spectrum and some typical enemy sensors operating within specific regions of the spectrum. An enemy uses detection sensors that operate in the active or passive mode:

- Active. Active sensors emit energy that reflects from targets and is recaptured by the emitting or other nearby sensor, indicating the presence of a target. Examples of active sensors are searchlights and radar.
- Passive. Passive sensors do not emit energy; they collect energy, which may indicate the presence of a target. Examples of passive sensors are the human eye, night-vision devices (NVDs), IR imaging devices, acoustic sensors, and

photographic devices.

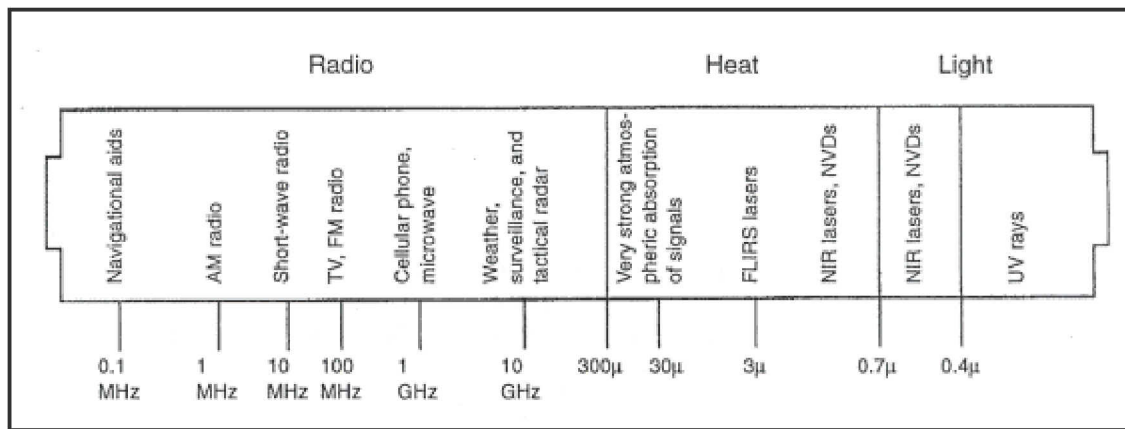


Figure 2-1. EM spectrum

VISUAL

2-10. Visual sensors work in the parts of the EM spectrum that are visible to the human eye. Enemy soldiers' eyes are the principle sensors on a battlefield. They may be aided by binoculars, telescopic sights, and image intensifiers. Civilian populations, enemy agents, recon teams, and patrols are visual-sensor systems from the enemy's intelligence viewpoint. Three types of enemy visual sensors are—

- Image intensifiers. Image intensifiers are passive night-observation devices. They amplify the low-level light that is present on even the darkest nights. These devices are used for surveillance and as weapon sights on small arms and vehicles. Airborne platforms are also capable of supporting image intensifiers.
- Low-light television (LLTV). LLTV combines image intensification with television technology, and it is usually mounted on airborne platforms.
- Aerial recon, remote sensing, and imagery. Aerial photography, satellite imagery, and video imagery allow image analysts to record and study visual information. These analysts then produce target nomination lists that are, in effect, priority lists of targets in a given target scene. Since analysts often have to make subjective determinations of the identity and/or importance of a given target, the ranking of targets provides the defender with an opportunity to use CCD to impact an enemy's target-prioritization process. Video systems allow transmission of visual images to the ground while the manned aircraft, satellite, or unmanned aerial vehicle (UAV) is still in flight.

NEAR INFRARED

2-11. NIR sensors operate at a wavelength immediately above the visible light wavelength of the EM spectrum (*Figure 2-1*). NIR energy reflects well from live vegetation but reflects better from dead vegetation and most man-made materials. NIR

sensors, such as sights and periscopes, allow the human eye to detect targets based on differences in their reflection of NIR energy. NIR sensors are partially blocked by fog, mist, and smoke operations, although not as completely as visual sensors. An enemy's combat vehicles use active NIR sensors that employ searchlights, scopes, and sights; but these sensors are rapidly being replaced with image intensifiers and thermal gun sights.

INFRARED

2-12. IR sensors detect the contrasts in heat energy that targets radiate on the battlefield and display the contrasts as different colors or shades. Because longer wavelength IR radiation is more susceptible to atmospheric absorption than NIR radiation, IR sensors are less affected by typical concentrations of fog or conventional smoke.

2-13. Differences in thermal mass and surface properties (reflectivity) of man-made and natural materials result in target-to-background contrasts. These contrast levels change dramatically over a daily cycle. For example, operating vehicles and generators, heated buildings and tents, and soldiers are usually hotter than their background. Also, equipment exposed to direct sunlight appears hotter than most natural backgrounds. At night, however, equipment might appear cooler than its background if it is treated with special emissivity coatings. In other words, military equipment, particularly metallic equipment, generally heats up and cools off more quickly than its background.

2-14. Sophisticated, passive IR sensors (such as the Forward-Looking Infrared System [FLIRS]) can be mounted on aircraft. FLIRS sensors provide aircrews and enemy ground forces with real-time IR imagery that is displayed on video monitors.

2-15. Recon aircraft often employ special IR films to record temperature differences. Due to film processing, however, these systems are subject to time delays in obtaining the data. Newer versions of this sensor produce non-film-based images.

ULTRAVIOLET

2-16. The UV area is the part of the EM spectrum immediately below visible light. UV sensors are more important in snow-covered areas, because snow reflects UV energy well and most white paints and man-made objects do not reflect UV energy very well. Photographic intelligence systems with simple UV filters highlight military targets as dark areas against snow-covered backgrounds. These backgrounds require specially designed camouflage that provides a high UV reflectance.

RADAR

2-17. Radar uses high-frequency radio waves to penetrate atmospheric impediments such as fog, mist, and smoke. Radar works by transmitting a very strong burst of radio waves and then receiving and processing the reflected waves. In general, metal objects reflect radar waves well, while radar waves are either weakly reflected by or pass through most other objects. The shape and size of a metal object determine the strength of the reflected signal. A large, metal object generally reflects more signal than a small object. Therefore, large, metal objects can be detected from greater distances. The method by which the received radio wave is processed determines the type of radar. Radar systems commonly

used against ground forces on the battlefield include—

- Moving-target indicators (MTIs). When an EM wave hits a moving target, the wave is reflected and changes frequency. The faster the target moves, the larger the changes in frequency. The simplest and most common battlefield radar detects this frequency change. Threat forces use MTIs for target acquisition. More sophisticated developmental radar systems, such as the Joint Surveillance Target Attack Radar System (JSTARS), use airborne surveillance platforms that downlink captured data to ground-station modules in near real time. Ground-based operators are then able to manipulate the data and gain heightened situational information, which is forwarded to command-and-control (C²) nodes to enhance tactical decision-making.
- Imaging radar. An imaging radar's receiver and processor are so sensitive that an image of the detected target is displayed on a scope. Imaging radar, such as side-looking airborne radar (SLAR), is generally used on airborne or space-borne platforms. Imaging radar typically does not provide the same resolution as the FLIRS and is less likely to be used for terminal target acquisition.
- Countermortar (CM) and counterbattery (CB) radar. CM and CB radar usually transmit two beams of energy that sweep above the horizon. An artillery or mortar round or a rocket passing through the beams reflects two signals that are received and plotted to determine the origin of the round.

ACOUSTIC

2-18. The three predominant types of acoustical detection systems are—

- Human ear. Every soldier, whether engaged in normal operations or at a listening post, is an acoustic sensor. However, visual confirmation is usually preferred.
- Flash-sound ranging. Flash-sound ranging is used against artillery. Light travels faster than sound, so enemy sound-ranging teams can determine the distance to a gun tube by accurately measuring the time between seeing a muzzle flash and hearing the sound. If the sound is detected by two or more teams, analysts plot the ranges using automated data-processing computers. The target is located where the plots intersect.
- Ground-based microphone array. Ground-based microphone-array systems allow listeners to record acoustic signatures and accurately triangulate their positions.

RADIO

2-19. Threat forces make a great effort to search for, detect, and locate the sources of US radio communications. They use various direction-finding techniques to locate opposing emitters. Once an emitter is detected, an enemy can take a number of actions, ranging from simply intercepting the transmissions to jamming or targeting the emitter for destruction. (See [FM 34-1](#) for more information on radio sensors.)

MULTISPECTRAL AND HYPERSPECTRAL

2-20. Recent advancements in sensor acquisition and information-processing technologies have fostered the advent of multispectral and hyperspectral sensors:

- **Multispectral.** Multispectral sensors typically scan a few broad-band channels within the EM spectrum. An example of a multispectral sensor might be one which coincidentally scans the visual and thermal IR portions of the EM spectrum. Such sensors allow an enemy to assess a cross section of EM wavelengths and acquire a target in one wavelength even though it might be effectively concealed in another.
- **Hyperspectral.** Hyperspectral sensors collect data across a continuous portion of the EM spectrum. These sensors scan many channels across a relatively narrow bandwidth and provide detailed information about target spatial and spectral patterns. Absorption and emission bands of given substances often occur within very narrow bandwidths. They allow high-resolution, hyperspectral sensors to distinguish the properties of the substances to a finer degree than an ordinary broadband sensor.

CCD VERSUS THREAT SENSORS

2-21. Target acquisition can be accomplished by a variety of sensors that operate throughout the EM spectrum. This poses a challenge in CCD planning and employment—determining which enemy sensor(s) that CCD operations should be designed to defeat. Unfortunately, no single answer is correct for all situations. Unit commanders without specific guidance from higher echelons assess their tactical situation and plan CCD operations accordingly. If intelligence data indicate that an enemy will use visual sensors for recon and target acquisition, then visual countermeasures must be employed. For IR or radar sensors, countermeasures that are effective in those spectra must be employed. If a multispectral or hyperspectral threat is anticipated, CCD operations are conducted to protect a unit in its most vulnerable EM bandwidths. Very few available camouflage materials or techniques provide complete broadband protection.

Chapter 3

Fundamentals

To remain a viable force on the battlefield, units must understand CCD fundamentals because they are essential to survivability. To design and place effective CCD, soldiers must constantly consider an enemy's point of view. (What will it see? What characteristics will its sensors detect?) Placing a low priority on CCD because of time constraints, minimal resources, or inconvenience could result in mission failure and unnecessary loss of life. ([Appendix D](#) contains more information on individual CCD.)

SECTION I — PRINCIPLES

AVOIDING DETECTION

3-1. The primary goal of CCD is to avoid enemy detection; however, this is not always feasible. In some cases, CCD may succeed by merely preventing an enemy from identifying a target. Simply avoiding identification is often sufficient to increase survivability. The following seven rules are critical when considering how to avoid detection or identification:

- Identify the enemy's detection capabilities.
- Avoid detection by the enemy's routine surveillance.
- Take countermeasures against the enemy's sensors.
- Employ realistic, CCD countermeasures.
- Minimize movement.
- Use decoys properly.
- Avoid predictable operational patterns.

IDENTIFYING THE THREAT

3-2. Obtain as much information as possible about an enemy's surveillance capability. Intelligence preparation of the battlefield (IPB) should—

- Include the sensors that an enemy may use in a particular AO.

- Include information on the enemy's tactical employment of the sensors, if possible.
- Assess the impact of the enemy's surveillance potential on the target under consideration. This assessment varies with the relative positions of the sensor and the target on the battlefield, the role of the target, and the physical characteristics of the sensor and the target.

AVOIDING DETECTION BY ROUTINE SURVEILLANCE

3-3. Sophisticated sensors often have narrow fields of view. Furthermore, sensors can be very expensive and are unlikely to be deployed in such numbers as to enable coverage of the entire battlefield at all times. Sophisticated sensors are most likely to be deployed in those areas where an enemy suspects that friendly targets are deployed. The enemy may suspect that an area contains targets because of detection by less sophisticated, wider-coverage sensors or because of tactical analysis. Therefore, an important aspect of remaining undetected is to avoid detection by routine enemy surveillance.

3-4. Many sensors operate as well at night as they do during the day. Therefore, darkness does not provide effective protection from surveillance. Passive sensors are very difficult to detect, so assume that they are being used at night. Do not allow antidetection efforts to lapse during the hours of darkness. For example, conceal spoil while excavating a fighting position, even at night. Certain types of smoke will also defeat NVDs.

TAKING COUNTERMEASURES

3-5. In some cases, it might be appropriate to take action against identified enemy sensors. The ability to deploy countermeasures depends on a number of factors—the effective range of friendly weapons, the distance to enemy sensors, and the relative cost in resources versus the benefits of preventing the enemy's use of the sensor. An additional factor to consider is that the countermeasure itself may provide an enemy with an indication of friendly intentions.

EMPLOYING REALISTIC CCD

3-6. The more closely a target resembles its background, the more difficult it is for an enemy to distinguish between the two. Adhering to this fundamental CCD principle requires awareness of the surroundings, proper CCD skills, and the ability to identify target EM signatures that enemy sensors will detect.

VISUAL SENSORS

3-7. The most plentiful, reliable, and timely enemy sensors are visual. Therefore, CCD

techniques effective in the visual portion of the EM spectrum are extremely important. Something that cannot be seen is often difficult to detect, identify, and target. BDUs, standard camouflage screening paint patterns (SCSPPs), LCSS, and battlefield obscurants are effective CCD techniques against visual sensors. Full-coverage CCD helps avoid visual detection by the enemy. When time is short, apply CCD first to protect the target from the most likely direction of attack and then treat the remainder of the target as time allows.

NEAR INFRARED SENSORS

3-8. NIR sights are effective at shorter ranges (typically 900 meters) than enemy main guns. While red filters help preserve night vision, they cannot prevent NIR from detecting light from long distances. Therefore, careful light discipline is an important countermeasure to NIR sensors and visual sensors (such as image intensifiers). BDUs, LCSS, battlefield obscurants, and SCSPPs are designed to help defeat NIR sensors.

INFRARED SENSORS

3-9. Natural materials and terrain shield heat sources from IR sensors and break up the shape of cold and warm military targets viewed on IR sensors. Do not raise vehicle hoods to break windshield glare because this exposes a hot spot for IR detection. Even if the IR system is capable of locating a target, the target's actual identity can still be disguised. Avoid building unnecessary fires. Use vehicle heaters only when necessary. BDU dyes, LCSSs, IR-defeating obscurants, and chemical-resistant paints help break up IR signatures; but they will not defeat IR sensors.

ULTRAVIOLET SENSORS

3-10. UV sensors are a significant threat in snow-covered areas. Winter paint patterns, the arctic LCSS, and terrain masking are critical means for defending against these sensors. Any kind of smoke will defeat UV sensors. Field-expedient countermeasures, such as constructing snow walls, also provide a means of defeating UV sensors.

RADAR

3-11. An enemy uses MTI, imaging, CM, and CB radars. Mission dictates the appropriate defense, while techniques depend on the equipment available.

Moving-Target Indicator

3-12. MTI radar is a threat to ground forces near a battle area. Radar-reflecting metal on uniforms has been reduced, and Kevlar helmets and body armor are now radar-transparent. Plastic canteens are standard issue, and buttons and other nonmetal fasteners have replaced metal snaps on most field uniforms. A soldier wearing only the BDU cannot be detected until he is very close to MTI radar.

3-13. Soldiers still carry metal objects (ammunition, magazines, weapons) to accomplish their mission, and most radar can detect these items. Therefore, movement discipline is very important. Moving by covered routes (terrain masking) prevents radar detection.

Slow, deliberate movements across areas exposed to radar coverage helps avoid detection by MTI radar.

3-14. Vehicles are large radar-reflecting targets, and a skilled MTI operator can even identify the type of vehicle. Moving vehicles can be detected by MTI radar from 20 kilometers, but travelling by covered routes helps protect against surveillance.

Imaging

3-15. Imaging radar is not a threat to individual soldiers. Concealing vehicles behind earth, masonry walls, or dense foliage effectively screens them from imaging radar. Light foliage may provide complete visual concealment; however, it is sometimes totally transparent to imaging radar. When properly deployed, the LCSS effectively scatters the beam of imaging radar. (See [Appendix C](#) for more information.)

Countermortar and Counterbattery

3-16. Radar is subject to overload. It is very effective and accurate when tracking single rounds; however, it cannot accurately process data on multiple rounds (four or more) that are fired simultaneously. Chaff is also effective against CM and CB radar if it is placed near the radar.

ACOUSTIC SENSORS

3-17. Noise discipline defeats detection by the human ear. Pyrotechnics or loudspeakers can screen noise, cover inherently noisy activities, and confuse sound interpretation.

3-18. It is possible to confuse an enemy by screening flashes or sounds. Explosives or pyrotechnics, fired a few hundred meters from a battery's position within a second of firing artillery, will effectively confuse sound-ranging teams. Coordinating fire with adjacent batteries (within two seconds) can also confuse enemy sound-ranging teams.

RADIO SENSORS

3-19. The best way to prevent an enemy from locating radio transmitters is to minimize transmissions, protect transmissions from enemy interception, and practice good radiotelephone-operator (RATELO) procedures. Preplanning message traffic, transmitting as quickly as possible, and using alternate communication means whenever possible ensure that transmissions are minimized. To prevent the enemy from intercepting radio communications, change the radio frequencies and use low-power transmissions, terrain masking, or directional or short-range antennas. ([FM 24-33](#) provides an in-depth review of reducing the threat to friendly communications.)

MINIMIZING MOVEMENT

3-20. Movement attracts the enemy's attention and produces a number of signatures (tracks, noise, hot spots, dust). In operations that inherently involve movement (such as offensive operations), plan, discipline, and manage movement so that signatures are

reduced as much as possible. (See [Chapter 4](#) for information on disciplined movement techniques.)

USING DECOYS

3-21. Use decoys to confuse an enemy. The goal is to divert enemy resources into reporting or engaging false targets. An enemy who has mistakenly identified decoys as real targets is less inclined to search harder for the actual, well-hidden targets. The keys to convincing an enemy that it has found the real target are—

- Decoy fidelity (realism), which refers to how closely the multispectral decoy signature represents the target signature.
- Deployment location, which refers to whether or not a decoy is deployed so that the enemy will recognize it as typical for that target type. For example, a decoy tank is not properly located if it is placed in the middle of a lake.

3-22. A high-fidelity decoy in a plausible location often fools an enemy into believing that it has acquired the real target. Deploying low-fidelity decoys, however, carries an associated risk. If an enemy observes a decoy and immediately recognizes it as such, it will search harder for the real target since decoys are generally deployed in the same vicinity as the real targets. Plausible, high-fidelity decoys specifically designed to draw enemy fire away from real targets should be deployed to closely represent the multispectral signatures of the real targets. Properly deployed decoys have been proven in operational employment and experimental field tests to be among the most effective of all CCD techniques.

AVOIDING OPERATIONAL PATTERNS

3-23. An enemy can often detect and identify different types of units or operations by analyzing the signature patterns that accompany their activities. For example, an offensive operation is usually preceded by the forward movement of engineer obstacle-reduction assets; petroleum, oils, and lubricants (POL); and ammunition. Such movements are very difficult to conceal; therefore, an alternative is to modify the pattern of resupply. An enemy will recognize repetitive use of the same CCD techniques.

APPLYING RECOGNITION FACTORS

3-24. To camouflage effectively, continually consider the threat's viewpoint. Prevent patterns in antidetection countermeasures by applying the following recognition factors to tactical situations. These factors describe a target's contrast with its background. If possible, collect multispectral imagery to determine which friendly target signatures are detectable to enemy sensors.

REFLECTANCE

3-25. Reflectance is the amount of energy returned from a target's surface as compared to the energy striking the surface. Reflectance is generally described in terms of the part of the EM spectrum in which the reflection occurs:

- *Visual reflectance* is characterized by the color of a target. Color contrast can be important, particularly at close ranges and in homogeneous background environments such as snow or desert terrain. The longer the range, the less important color becomes. At very long ranges, all colors tend to merge into a uniform tone. Also, the human eye cannot discriminate color in poor light.
- *Temperature reflectance* is the thermal energy reflected by a target (except when the thermal energy of a target is self-generated, as in the case of a hot engine). IR imaging sensors measure and detect differences in temperature-reflectance levels (known as thermal contrast).
- *Radar-signal reflectance* is the part of the incoming radio waves that is reflected by a target. Radar sensors detect differences in a target's reflected radar return and that of the background. Since metal is an efficient radio-wave reflector and metals are still an integral part of military equipment, radar return is an important reflectance factor.

SHAPE

3-26. Natural background is random, and most military equipment has regular features with hard, angular lines. Even an erected camouflage net takes on a shape with straight-line edges or smooth curves between support points. An enemy can easily see silhouetted targets, and its sensors can detect targets against any background unless their shape is disguised or disrupted. Size, which is implicitly related to shape, can also distinguish a target from its background.

SHADOW

3-27. Shadow can be divided into two types:

- A *cast shadow* is a silhouette of an object projected against its background. It is the more familiar type and can be highly conspicuous. In desert environments, a shadow cast by a target can be more conspicuous than the target itself.
- A *contained shadow* is the dark pool that forms in a permanently shaded area. Examples are the shadows under the track guards of an armored fighting vehicle (AFV), inside a slit trench, inside an open cupola, or under a vehicle. Contained shadows show up much darker than their surroundings and are easily detected by an enemy.

MOVEMENT

3-28. Movement always attracts attention against a stationary background. Slow, regular

movement is usually less obvious than fast, erratic movement.

NOISE

3-29. Noise and acoustic signatures produced by military activities and equipment are recognizable to the enemy.

TEXTURE

3-30. A rough surface appears darker than a smooth surface, even if both surfaces are the same color. For example, vehicle tracks change the texture of the ground by leaving clearly visible track marks. This is particularly true in undisturbed or homogeneous environments, such as a desert or virgin snow, where vehicle tracks are highly detectable. In extreme cases, the texture of glass or other very smooth surfaces causes a shine that acts as a beacon. Under normal conditions, very smooth surfaces stand out from the background. Therefore, eliminating shine must be a high priority in CCD.

PATTERNS

3-31. Rows of vehicles and stacks of war materiel create equipment patterns that are easier to detect than random patterns of dispersed equipment. Equipment patterns should be managed to use the surroundings for vehicle and equipment dispersal. Equipment dispersal should not be implemented in such a way that it reduces a unit's ability to accomplish its mission.

3-32. Equipment paint patterns often differ considerably from background patterns. The critical relationships that determine the contrast between a piece of equipment and its background are the distance between the observer and the equipment and the distance between the equipment and its background. Since these distances usually vary, it is difficult to paint equipment with a pattern that always allows it to blend with its background. As such, no single pattern is prescribed for all situations. Field observations provide the best match between equipment and background.

3-33. The overall terrain pattern and the signatures produced by military activity on the terrain are important recognition factors. If a unit's presence is to remain unnoticed, it must match the signatures produced by stationary equipment, trucks, and other activities with the terrain pattern. Careful attention must also be given to vehicle tracks and their affect on the local terrain during unit ingress, occupation, and egress.

SITE SELECTION

3-34. Site selection is extremely important because the location of personnel and equipment can eliminate or reduce recognition factors. If a tank is positioned so that it faces probable enemy sensor locations, the thermal signature from its hot engine compartment is minimized. If a vehicle is positioned under foliage, the exhaust will disperse and cool as it rises, reducing its thermal signature and blending it more closely with the background. Placing equipment in defilade (dug-in) positions prevents detection

by ground-mounted radar. The following factors govern site selection:

MISSION

3-35. The mission is the most important factor in site selection. A particular site may be excellent from a CCD standpoint, but the site is useful only if the mission is accomplished. If a site is so obvious that the enemy will acquire and engage a target before mission accomplishment, the site was poorly selected to begin with. Survivability is usually a part of most missions, so commanders must first evaluate the worthiness of a site with respect to mission accomplishment and then consider CCD.

DISPERSION

3-36. Dispersion requirements dictate the size of a site. A site has limited usefulness if it will not permit enough dispersal for survivability and effective operations.

TERRAIN PATTERNS

3-37. Every type of terrain, even a flat desert, has a discernible pattern. Terrain features can blur or conceal the signatures of military activity. By using terrain features, CCD effectiveness can be enhanced without relying on additional materials. The primary factor to consider is whether using the site will disturb the terrain pattern enough to attract an enemy's attention. The goal is not to disturb the terrain pattern at all. Any change in an existing terrain pattern will indicate the presence of activity. Terrain patterns have distinctive characteristics that are necessary to preserve. The five general terrain patterns are—

- Agricultural. Agricultural terrain has a checkerboard pattern when viewed from aircraft. This is a result of the different types of crops and vegetation found on most farms.
- Urban. Urban terrain is characterized by uniform rows of housing with interwoven streets and interspersed trees and shrubs.
- Wooded. Woodlands are characterized by natural, irregular features, unlike the geometric patterns of agricultural and urban terrains.
- Barren. Barren terrain presents an uneven, irregular work of nature without the defined patterns of agricultural and urban areas. Desert environments are examples of barren terrain.
- Arctic. Arctic terrain is characterized by snow and ice coverage.

CCD DISCIPLINE

3-38. CCD discipline is avoiding an activity that changes the appearance of an area or reveals the presence of military equipment. CCD discipline is a continuous necessity that applies to every soldier. If the prescribed visual and audio routines of CCD discipline are

not observed, the entire CCD effort may fail. Vehicle tracks, spoil, and debris are the most common signs of military activity. Their presence can negate all efforts of proper placement and concealment.

3-39. CCD discipline denies an enemy the indications of a unit's location or activities by minimizing disturbances to a target area. To help maintain unit viability, a unit must integrate all available CCD means into a cohesive plan. CCD discipline involves regulating light, heat, noise, spoil, trash, and movement. Successful CCD discipline depends largely on the actions of individual soldiers. Some of these actions may not be easy on a soldier, but his failure to observe CCD discipline could defeat an entire unit's CCD efforts and possibly impact the unit's survivability and mission success.

3-40. TACSOPs prescribing CCD procedures aid in enforcing CCD discipline, and they should—

- List specific responsibilities for enforcing established CCD countermeasures and discipline.
- Detail procedures for individual and unit conduct in assembly areas (AAs) or other situations that may apply to the specific unit.

3-41. Units should have frequent CCD battle drills. CCD discipline is a continuous requirement that calls for strong leadership, which produces a disciplined CCD consciousness throughout the entire unit. [Appendix B](#) contains additional guidance for incorporating CCD into a unit TACSOP.

LIGHT AND HEAT

3-42. Light and heat discipline, though important at all times, is crucial at night. As long as visual observation remains a primary recon method, concealing light signatures remains an important CCD countermeasure. Lights that are not blacked out at night can be observed at great distances. For example, the human eye can detect camp fires from 8 kilometers and vehicle lights from 20 kilometers. Threat surveillance can also detect heat from engines, stoves, and heaters from great distances. When moving at night, vehicles in the forward combat area should use ground guides and blackout lights. When using heat sources is unavoidable, use terrain masking, exhaust baffling, and other techniques to minimize thermal signatures of fires and stoves.

NOISE

3-43. Individuals should avoid or minimize actions that produce noise. For example, muffle generators by using shields or terrain masking or place them in defilade positions. Communications personnel should operate their equipment at the lowest possible level that allows them to be heard and understood. Depending on the terrain and atmospheric conditions, noise can travel great distances and reveal a unit's position to an enemy.

SPOIL

3-44. The prompt and complete policing of debris and spoil is an essential CCD

consideration. Proper spoil discipline removes a key signature of a unit's current or past presence in an area.

TRACK

3-45. Vehicle tracks are clearly visible from the air, particularly in selected terrain. Therefore, track and movement discipline is essential. Use existing roads and tracks as much as possible. When using new paths, ensure that they fit into the existing terrain's pattern. Minimize, plan, and coordinate all movement; and take full advantage of cover and dead space.

SECTION II — TECHNIQUES AND MATERIALS

TECHNIQUES

3-46. CCD is an essential part of tactical operations. It must be integrated into METT-TC analyses and the IPB process at all echelons. CCD is a primary consideration when planning OPSEC. The skillful use of CCD techniques is necessary if a unit is to conceal itself and survive. A general knowledge of CCD methods and techniques also allows friendly troops to recognize CCD better when the enemy uses it. [Table 3-1](#) lists the five general techniques of employing CCD—hiding, blending, disguising, disrupting, and decoying.

Table 3-1. CCD techniques

CCD Techniques	Sensor Systems		
	Optical	Thermal	Radar
Hiding	Earth cover Earth embankments Vegetation LCSS Screens Smoke	Earth cover Earth embankments Vegetation LCSS Screens Smoke	Chaff Earth cover Earth embankments Vegetation Nets RAM LCSS
Blending	Paint Foam Lights Vegetation LCSS	Thermal paint Foam Air conditioning/heating Vegetation	Vegetation LCSS RAM Reshaping Textured mats

	Textured mats	LCSS Textured mats Water Insulation	
Disguising	Reshaping Paint LCSS	Reshaping Paint	Corner reflectors
Disrupting	Camouflage sails FOS Pyrotechnics Smudge pots Balloons Strobe lights Tracer simulators Smoke	Flares Smoke	Chaff Corner reflectors
Decoying	Decoy target (pneumatic or rigid structures) Lights Smoke	Decoy target Flares Air conditioning/heating Smoke	Decoy target Corner reflectors Signal generators

HIDING

3-47. Hiding is screening a target from an enemy's sensors. The target is undetected because a barrier hides it from a sensor's view. Every effort should be made to hide all operations; this includes using conditions of limited visibility for movement and terrain masking. Examples of hiding include—

- Burying mines.
- Placing vehicles beneath tree canopies.
- Placing equipment in defilade positions.
- Covering vehicles and equipment with nets.
- Hiding roads and obstacles with linear screens.
- Using battlefield obscurants, such as smoke.

BLENDING

3-48. Blending is trying to alter a target's appearance so that it becomes a part of the background. Generally, it is arranging or applying camouflage material on, over, and/or around a target to reduce its contrast with the background. Characteristics to consider when blending include the terrain patterns in the vicinity and the target's size, shape,

texture, color, EM signature, and background.

DISGUIISING

3-49. Disguising is applying materials on a target to mislead the enemy as to its true identity. Disguising changes a target's appearance so that it resembles something of lesser or greater significance. For example, a missile launcher might be disguised to resemble a cargo truck or a large building might be disguised to resemble two small buildings.

DISRUPTING

3-50. Disrupting is altering or eliminating regular patterns and target characteristics. Disrupting techniques include pattern painting, deploying camouflage nets over selected portions of a target, and using shape disrupters (such as camouflage sails) to eliminate regular target patterns.

DECOYING

3-51. Decoying is deploying a false or simulated target(s) within a target's scene or in a position where the enemy might conclude that it has found the correct target(s). Decoys generally draw fire away from real targets. Depending on their fidelity and deployment, decoys will greatly enhance survivability.

TESTS AND EVALUATIONS

3-52. Until recently, the effectiveness of CCD techniques had not been scientifically quantified. As such, CCD was not widely accepted in the US military as an effective means of increasing survivability. However, the Joint Camouflage, Concealment, and Deception (JCCD) Joint Test and Evaluation (JT&E) completed in 1995 measured the effectiveness of CCD against manned aerial attacks. It provided military services the basis for guidance on CCD-related issues. JCCD field tests were conducted in multiple target environments using a broad cross section of US attack aircraft flying against different classes of military targets. In controlled attack sorties, targets were attacked before and after employing CCD techniques.

3-53. The presence of CCD greatly reduced correct target attacks, particularly when decoys were employed as part of the CCD plan. Other JCCD findings included the following:

- CCD significantly increased aircrew aim-point error.
- CCD increased the target's probability of survival.
- Each CCD technique (hiding, blending, disguising, disrupting, and decoying) was effective to some degree in increasing the probability of survival.
- CCD was effective in all tested environments (desert, temperate, and subarctic).

NATURAL CONDITIONS

3-54. Properly using terrain and weather is a first priority when employing CCD. Cover provided by the terrain and by conditions of limited visibility is often enough to conceal units. The effective use of natural conditions minimizes the resources and the time devoted to CCD. The terrain's concealment properties are determined by the number and quality of natural screens, terrain patterns, and the type and size of targets.

FORESTS

3-55. Forests generally provide the best type of natural screen against optical recon, especially if the crowns of the trees are wide enough to prevent aerial observation of the ground. Forests with undergrowth also hinder ground observation. Deciduous (leafing) forests are not as effective during the months when trees are bare, while coniferous (evergreen) forests preserve their concealment properties all year. When possible, unit movements should be made along roads and gaps that are covered by tree crowns. Shade should be used to conceal vehicles, equipment, and personnel from aerial observation.

OPEN TERRAIN

3-56. Limited visibility is an especially important concealment tool when conducting operations in open terrain. The threat, however, will conduct recon with a combination of night-surveillance devices, radar, IR sensors, and terrain illumination. When crossing open terrain during limited visibility, supplement concealment with smoke.

DEAD SPACE

3-57. Units should not locate or move along the topographic crests of hills or other locations where they are silhouetted against the sky. They should use reverse slopes of hills, ravines, embankments, and other terrain features as screens to avoid detection by ground-mounted sensors. IPB concealment and terrain overlays should identify areas of dead space. If overlays are not available, use the line-of-sight (LOS) method to identify areas of dead space. (See [FM 21-26](#) for more details.)

WEATHER

3-58. Conditions of limited visibility (fog, rain, snowfall) hamper recon by optical sensors. Dense fog is impervious to visible sensors and some thermal sensors, making many threat night-surveillance devices unusable. Dense fog and clouds are impenetrable to thermal sensors (IR). Rain, snow, and other types of precipitation hinder optical, thermal, and radar sensors.

SMOKE

3-59. Smoke is an effective CCD tool when used by itself or with other CCD techniques. It can change the dynamics of a battle by blocking or degrading the spectral bands that an enemy's target-acquisition and weapons systems use, including optical and thermal bands. (See [FM 3-50](#), for more information on planning smoke operations.)

DATA SOURCES

3-60. Commanders must be able to evaluate natural conditions in their area to effectively direct unit concealment. They must know the terrain and weather conditions before mission execution. In addition to IPB terrain overlays, weather reports, and topographic maps, commanders should use aerial photographs, recon, and information gathered from local inhabitants to determine the terrain's natural concealment properties.

MATERIALS

3-61. Using natural conditions and materials is the first CCD priority, but using man-made materials can greatly enhance CCD efforts. Available materials include pattern-painted equipment, camouflage nets (LCSS), radar-absorbing paint (RAP), radar-absorbing material (RAM), false operating surfaces (FOSs), vegetation, expedient paint, decoys, and battlefield by-products (construction materials, dirt). ([Appendix E](#) lists man-made CCD materials that are available through the supply system.)

PATTERN PAINT

3-62. Pattern-painted vehicles blend well with the background and can hide from optical sensors better than those painted a solid, subdued color. Pattern-painted equipment enhances antidetection by reducing shape, shadow, and color signatures. Improved paints also help avoid detection by reducing a target's reflectance levels in the visible and IR portions of the EM spectrum. The result is a vehicle or an item of equipment that blends better with its background when viewed by threat sensors. While a patterned paint scheme is most effective in static positions, it also tends to disrupt aim points on a moving target. (See [Appendix E](#) for a list of available paints.)

CAMOUFLAGE NETS

3-63. The LCSS is the standard Army camouflage net currently available, and it can be ordered through normal unit supply channels (see [Appendix E](#)). The LCSS reduces a vehicle's visual and radar signatures. Stainless steel fibers in the LCSS material absorb some of the radar signal and reflect most of the remaining signal in all directions. The result is a small percentage of signal return to the radar for detection. The radar-scattering capabilities of the LCSS are effective only if there is at least 2 feet of space between the LCSS and the camouflaged equipment and if the LCSS completely covers the equipment. Do not place a radar-scattering net over a radar antenna because it interferes with transmission. The LCSS is also available in a radar-transparent model.

3-64. The three different LCSS color patterns are desert, woodland, and arctic. Each side of each LCSS has a slightly different pattern to allow for seasonal variations. The LCSS uses modular construction that allows the coverage of various sizes of equipment. ([Appendix C](#) discusses the required components and the instructions for assembling LCSS structures for different sizes of equipment.)

VEGETATION

3-65. Use branches and vines to temporarily conceal vehicles, equipment, and personnel. Attach vegetation to equipment with camouflage foliage brackets, spring clips, or expedient means (such as plastic tie-wraps). Use other foliage to complete the camouflage or to supplement natural-growing vegetation. Also use cut foliage to augment other artificial CCD materials, such as branches placed on an LCSS to break up its outline. Be careful when placing green vegetation since the underside of leaves presents a lighter tone in photographs. Replace cut foliage often because it wilts and changes color rapidly. During training exercises, ensure that cutting vegetation and foliage does not adversely effect the natural environment (coordinate with local authorities).

Living Vegetation

3-66. Living vegetation can be obtained in most environments, and its color and texture make it a good blending agent. However, foliage requires careful maintenance to keep the material fresh and in good condition. If branches are not placed in their proper growing positions, they may reveal friendly positions to enemy observers. Cutting large amounts of branches can also reveal friendly positions, so cut all vegetation away from target areas.

3-67. Living vegetation presents a chlorophyll response at certain NIR wavelengths. As cut vegetation wilts, it loses color and its NIR-blending properties, which are related to the chlorophyll response. Replace cut vegetation regularly because over time it becomes a detection cue rather than an effective concealment technique.

Dead Vegetation

3-68. Use dead vegetation (dried grass, hay, straw, branches) for texturing. It provides good blending qualities if the surrounding background vegetation is also dead. Dead vegetation is usually readily available and requires little maintenance; however, it is flammable. Due to the absence of chlorophyll response, dead vegetation offers little CCD against NIR sensors and hyperspectral sensors operating in the IR regions.

Foliage Selection

3-69. When selecting foliage for CCD, consider the following:

- Coniferous vegetation is preferred to deciduous vegetation since it maintains a valid chlorophyll response longer after being cut.
- Foliage cut during periods of high humidity (at night, during a rainstorm, or when there is fog or heavy dew) will wilt more slowly.
- Foliage with leaves that feel tough to the fingers and branches with large leaves are preferred because they stay fresher longer.
- Branches that grow in direct sunlight are tougher and will stay fresher longer.
- Branches that are free of disease and insects will not wilt as rapidly.

CHLOROPHYLL RESPONSE

3-70. Standard-issue camouflage materials (LCSS) are designed to exhibit an artificial chlorophyll response at selected NIR wavelengths. Nonstandard materials (sheets, tarps) are not likely to exhibit a chlorophyll response and will not blend well with standard CCD material or natural vegetation. Use nonstandard materials only as CCD treatments against visual threat sensors, not against NIR or hyperspectral threat sensors.

EXPEDIENT PAINT

CAUTION

Expedient paint containing motor oil should be used with extreme caution.

3-71. Use earth, sand, and gravel to change or add color, provide a coarse texture, simulate cleared spots or blast marks, and create shapes and shadows. Mud makes an excellent field expedient for toning down bright, shiny objects (glass, bayonets, watches). Add clay (in mud form) of various colors to crankcase oil to produce a field-expedient paint. [Table 3-2](#) provides instructions on how to mix soil-based expedient paints. Use surface soils to mimic natural surface color and reflectivity.

Table 3-2. Expedient paints

Paint Materials	Mixing	Color	Finish
Earth, GI soap, water, soot, paraffin	Mix soot with paraffin, add to solution of 8 gal water and 2 bars soap, and stir in earth.	Dark gray	Flat, lusterless
Oil, clay, water, gasoline, earth	Mix 2 gal water with 1 gal oil and to gal clay, add earth, and thin with gasoline or water.	Depends on earth colors	Glossy on metal, otherwise dull
Oil, clay, GI soap, water, earth	Mix 1 bars soap with 3 gal water, add 1 gal oil, stir in 1 gal clay, and add earth for color.	Depends on earth colors	Glossy on metal, otherwise dull
NOTE: Use canned milk or powdered eggs to increase the binding properties of field-expedient paints.			

RADAR-ABSORBING MATERIAL

3-72. RAM was designed for placement on valuable military equipment. It absorbs radar signals that are transmitted in selected threat wave bands and reduces the perceived radar cross section (RCS) of the treated equipment. RAM is expensive relative to other CCD equipment and is not yet widely available. RAP offers the same RCS reduction benefits

as RAM, and it is also expensive.

BATTLEFIELD BY-PRODUCTS

3-73. Battlefield by-products (construction materials, dirt) can be used to formulate expedient CCD countermeasures. For example, use plywood and two-by-fours to erect expedient target decoys or use dirt to construct concealment berms.

DECOYS

3-74. Decoys are among the most effective of all CCD tools. The proper use of decoys provides alternate targets against which an enemy will expend ammunition, possibly revealing its position in the process. Decoys also enhance friendly survivability and deceive an enemy about the number and location of friendly weapons, troops, and equipment.

Employment Rationale

3-75. Decoys are used to attract an enemy's attention for a variety of tactical purposes. Their main use is to draw enemy fire away from high-value targets (HVTs). Decoys are generally expendable, and they—

- Can be elaborate or simple. Their design depends on several factors, such as the target to be decoyed, a unit's tactical situation, available resources, and the time available to a unit for CCD employment.
- Can be preconstructed or made from field-expedient materials. Except for selected types, preconstructed decoys are not widely available (see [Appendix E](#)). A typical Army unit can construct effective, realistic decoys to replicate its key equipment and features through imaginative planning and a working knowledge of the EM signatures emitted by the unit.

3-76. Proper decoy employment serves a number of tactical purposes, to include—

- Increasing the survivability of key unit equipment and personnel.
- Deceiving the enemy about the strength, disposition, and intentions of friendly forces.
- Replacing friendly equipment removed from the forward line of own troops (FLOT).
- Drawing enemy fire, which reveals its positions.
- Encouraging the enemy to expend munitions on relatively low-value targets (decoys).

Employment Considerations

3-77. The two most important factors regarding decoy employment are location and

fidelity (realism):

- Location. Logically placing decoys will greatly enhance their plausibility. Decoys are usually placed near enough to the real target to convince an enemy that it has found the target. However, a decoy must be far enough away to prevent collateral damage to the real target when the decoy draws enemy fire. Proper spacing between a decoy and a target depends on the size of the target, the expected enemy target-acquisition sensors, and the type of munitions directed against the target.
- Fidelity. Decoys must be constructed according to a friendly unit's SOP and must include target features that an enemy recognizes. The most effective decoys are those that closely resemble the real target in terms of EM signatures. Completely replicating the signatures of some targets, particularly large and complex targets, can be very difficult. Therefore, decoy construction should address the EM spectral region in which the real target is most vulnerable. The seven recognition factors that allow enemy sensors to detect a target are conversely important for decoys. When evaluating a decoy's fidelity, it should be recognizable in the same ways as the real target, only more so. Try to make the decoy slightly more conspicuous than the real target.

Chapter 4

Offensive Operations

CCD countermeasures implemented during an offensive operation deceive the enemy or prevent it from discovering friendly locations, actions, and intentions. Successful CCD contributes to achieving surprise and reduces subsequent personnel and equipment losses.

PREPARATIONS

4-1. The main CCD concern in preparing for offensive operations is to mask tactical unit deployment. While CCD is the primary means of masking these activities, deceptive operations frequently achieve the same goals.

SIGNATURES

4-2. Offensive operations create signatures that are detectable to an enemy. Analyzing these signatures may alert an enemy to the nature of an offensive operation (such as planning and location). Commanders at all levels should monitor operation signatures and strive to conceal them from enemy surveillance. These signatures include—

- Increasing scouting and recon activity.
- Preparing traffic routes.
- Moving supplies and ammunition forward.
- Breaching obstacles.
- Preparing and occupying AAs (engineer function).
- Preparing and occupying forward artillery positions.
- Increasing radio communications.

ASSEMBLY AREAS

4-3. Prepare AAs during limited visibility. They should then suppress the signatures that their preparations produced and remove any indications of their activities upon mission completion.

4-4. Designate AAs on terrain with natural screens and a developed network of roads and paths. Thick forests and small towns and villages often provide the best locations. If natural screens are unavailable, use spotty sectors of the terrain or previously occupied locations. Place equipment on spots of matching color, and take maximum advantage of artificial CCD materials.

4-5. Designate concealed routes for movement into and out of an area. Mask noise by practicing good noise discipline. For instance, armor movements can be muffled by the thunder of artillery fire, the noise of low-flying aircraft, or the transmission of sounds from broadcast sets.

4-6. Position vehicles to take full advantage of the terrain's natural concealment properties, and cover the vehicles with camouflage nets. Apply paint and cut vegetation to vehicles to enhance CCD at AAs and during battle. (When using vegetation for this type of CCD treatment, do not cut it from areas close to vehicles.) AAs are particularly vulnerable to aerial detection. Strictly enforce track, movement, and radio discipline. Remove tracks by covering or sweeping them with branches.

4-7. While at an AA, personnel should apply individual CCD. Applying stick paint and cut vegetation enhances CCD during all phases of an operation.

DECOYS

4-8. An enemy may interpret decoy construction as an effort to reinforce a defensive position. Laying false minefields and building bunkers and positions can conceal actual offensive preparations and give the enemy the impression that defenses are being improved. If necessary, conduct engineer preparation activities on a wide front so that the area and direction of the main attack are not revealed.

MOVEMENT

4-9. Move troops, ammunition, supplies, and engineer breaching equipment forward at night or during limited visibility. Although an enemy's use of radar and IR aerial recon hinders operations at night, darkness remains a significant concealment tool. Select routes that take full advantage of the terrain's screening properties. Commanders must understand how to combine darkness and the terrain's concealing properties to conceal troop and supply movements.

4-10. When conducting a march, convoy commanders must strictly enforce blackout requirements and the order of march. Guidelines concerning lighting, march orders, and other requirements are usually published in SOPs or operation orders (OPORDs). Required lighting conditions vary depending on the type of movement (convoy versus single vehicle) and a unit's location (forward edge of the battle area [FEBA], division area, corps rear area). Inspect each vehicle's blackout devices for proper operation.

4-11. Enemy aerial recon usually focuses on open and barely passable route sectors. When on a march, vehicles should pass these types of sectors at the highest possible speeds. If prolonged delays result from encountering an unexpected obstacle, halt the column and disperse into the nearest natural screens. If a vehicle breaks down during a movement, push it off the road and conceal it.

4-12. When conducting a march during good visibility, consider movement by infiltration (single or small groups of vehicles released at different intervals). Movement in stages, from one natural screen to the next, will further minimize possible detection. Use smoke screens at critical crossings and choke points.

4-13. During brief stops, quickly disperse vehicles under tree crowns or other concealment along the sides of the road. Strictly enforce CCD discipline. Watch for glare from vehicle windshields, headlights, or reflectors; and remedy the situation if it does occur. Try to control troop movement on the road or in other open areas. Conduct recon to select areas for long halts. The recon party should select areas that are large enough to allow sufficient CCD and dispersion. The quartering party should predetermine vehicle placement, develop a vehicle circulation plan, and guide vehicles into suitable and concealed locations. The first priority, however, is to move vehicles off the road as quickly as possible, even at the expense of initial dispersion. Use camouflage nets and natural vegetation to enhance concealment, and carefully conceal dug-in positions.

4-14. Traffic controllers have a crucial role in enforcing convoy CCD. Commanders should issue precise instructions for traffic controllers to stop passing vehicles and have the drivers correct the slightest violation of CCD discipline. Convoy commanders are responsible for the convoy's CCD discipline.

4-15. Pass through friendly obstacles at night, in fog, or under other conditions of poor visibility. Also use smoke screens because these conditions will not protect against many types of threat sensors. Lay smoke on a wide front, several times before actually executing the passage of lines. Doing this helps deceive an enemy about the time and place of an attack. Conceal lanes through obstacles from the enemy's view.

DECEPTIVE OPERATIONS

4-16. Conduct demonstrations and feints to confuse an enemy about the actual location of the main attack. Such deceptive operations are effective only if prior recon activities were conducted on a wide front, thereby preventing the enemy from pinpointing the likely main-attack area.

BATTLE

4-17. Units should adapt to the terrain during a battle. Deploying behind natural vegetation, terrain features, or man-made structures maximizes concealment from enemy observation. Make optimum use of concealed routes, hollows, gullies, and other terrain features that are dead-space areas to enemy observation and firing positions. A trade-off, however, usually exists in terms of a slower rate of movement when using these types of routes.

4-18. Movement techniques emphasizing fire and maneuver help prevent enemy observation and targeting. Avoid dusty terrain because clouds of dust will alert an enemy to the presence of friendly units. However, if the enemy is aware of a unit's presence, dust can be an effective means of obscuring the unit's intentions in the same way as smoke. When natural cover and concealment are unavailable or impractical, the coordinated employment of smoke, suppressive fires, speed, and natural limited-visibility conditions minimize exposure and avoid enemy fire sacks. However, offensive operations under these conditions present unique training and C² challenges.

4-19. Breaching operations require concealing the unit that is conducting the breach. Use conditions of poor visibility, and plan the use of smoke and suppressive fires to screen breaching operations.

4-20. Deliberate river crossings are uniquely difficult and potentially hazardous. Plan the coordinated use of terrain masking, smoke, decoys, and deceptive operations to ensure successful crossings (see [FM 90-13](#)).

Chapter 5

Defensive Operations

Successful defensive operations require strong emphasis on OPSEC. Proper OPSEC denies an enemy information about a friendly force's defensive preparations. Particularly important is the counterrecon battle, where defensive forces seek to blind an enemy by eliminating its recon forces. The winner of this preliminary battle is often the winner of the main battle. CCD, by virtue of its inherent role in counterefforts, plays an important role in both battles.

PREPARATIONS

5-1. The purpose of CCD during defensive preparations is to mask key or sensitive activities. Successful CCD of these activities leads to an enemy force that is blinded or deceived and therefore more easily influenced to attack where the defender wants (at the strengths of the defense). These key activities include—

- Preparing reserve and counterattack forces' locations.
- Preparing survivability positions and constructing obstacles (minefields, tank ditches).
- Establishing critical C² nodes.

SIGNATURES

5-2. A number of signatures may indicate the intentions of friendly defensive preparations, and an enemy analyzes these signatures to determine the defensive plan. Specific signatures that could reveal defensive plans include—

- Working on survivability positions.
- Emplacing minefields and other obstacles.
- Moving different types of combat materiel into prepared positions.
- Preparing routes and facilities.
- Constructing strongpoints or hardened artillery positions.

COUNTERATTACK AND RESERVE FORCES

5-3. Due to the similarity of missions, the concerns for concealing counterattack and reserve forces are similar to those of maneuver forces engaged in offensive operations. [Chapter 4](#) discusses considerations about AAs, troop and supply movements, passages of

lines, and deception operations. This information is also useful as a guide when planning CCD for a counterattack.

Planning

5-4. Proper planning is essential to avoid threat detection and prevent successful enemy analysis of the engineer efforts that are integral to defensive preparations. Engineer equipment creates significant signatures, so minimize its use to a level that is commensurate with available time and manpower. Disperse engineer equipment that is not required at the job site. Complete as much work as possible without using heavy equipment, and allow heavy equipment on site only when necessary. Engineers should minimize their time on site by conducting thorough, extensive planning and preparation. Additional signatures include—

- Supplies, personnel, and vehicles arriving to and departing from the unit area.
- Survivability positions being constructed.
- Smoke and heat emitting from kitchens, fires, or stoves.
- Communications facilities being operated.
- Educational and training exercises being conducted.

Movement

5-5. Reserve forces should move along preplanned, concealed routes. They should also move and occupy selected locations at night or during other conditions of limited visibility. Quarters parties should preselect individual positions and guide vehicles and personnel to assigned locations. Light, noise, and track discipline are essential; but they are difficult to control during this phase. The quarters party should also develop a traffic-flow plan that minimizes vehicle and troop movement to and from the unit area.

5-6. Arriving units should immediately begin to conceal their positions. Commanders should detail the priorities for CCD in the OPORD, based on their assessment of which signatures present the greatest opportunity for threat detection.

Assembly Areas

5-7. While AA CCD actions are similar to those of counterattack and reserve positions, the latter positions are more likely to be occupied longer. Therefore, CCD needs are more extensive and extended for counterattack and reserve forces. In fact, their CCD operations are often indistinguishable from those of support units.

5-8. Counterattack and reserve forces awaiting employment should capitalize on the time available to conduct rehearsals. While essential, these activities are prone to detection by an enemy's sensors so observe CCD discipline at all times and locations.

Placement and Dispersal

5-9. Site selection is crucial when concealing engineer effort. Proper placement and dispersal of equipment and operations are essential. Use natural screens (terrain masking); however, urban areas often provide the best concealment for counterattack and reserve forces. ([Chapter 7](#) discusses placement and dispersal in more detail.) When using forests as natural screens, carefully consider factors such as the height and density of vegetation, the amount and darkness of shadows cast by the screen, and the appropriateness of the particular screen for the season. The condition and quality of natural screens have a decisive effect on the capability to conceal units. Commanders should evaluate natural screens during engineer recon missions and conduct the missions on a timely, extensive basis.

5-10. The probability of detection increases considerably when survivability positions are prepared. Detection is easier due to the increased size of the targets to be concealed, the contrasting upturned soil, and the difficulty of concealing survivability effort. Despite these considerations, the enhanced protection afforded by survivability positions usually dictates their use. To minimize the probability of detection, employ a combination of natural screens and overhead nets to conceal construction sites.

CAMOUFLAGE NETS

5-11. Use camouflage nets (LCSS) to conceal vehicles, tents, shelters, and equipment. Use vegetation to further disrupt the outline of the target rather than completely hide it. Ensure that vegetation is not removed from a single location, because it could leave a signature for threat detection. Gather vegetation sparingly from as many remote areas as possible. This technique allows the immediate area to remain relatively undisturbed.

STOVES AND FIRES

5-12. Strictly control the use of stoves and fires because they produce visual and thermal signatures detectable to threat sensors. If fires are necessary, permit them only during daylight hours and place them in dead ground or under dense foliage. Use nets and other expedient thermal screens to dissipate rising heat and reduce the fire's thermal signature.

COMMUNICATIONS

5-13. Monitor communications to prevent enemy intelligence teams from identifying unit locations. ([FM 24-33](#) addresses techniques for reducing the threat to friendly communications.)

CCD DISCIPLINE

5-14. Strict CCD discipline allows the continued concealment of a unit's position. The longer a unit stays in one location, the harder it is for it to maintain CCD discipline. Extended encampments require constant command attention to CCD discipline. The evacuation of an area also requires CCD discipline to ensure that evidence (trash, vehicle tracks) is not left for enemy detection.

SURVIVABILITY POSITIONS AND OBSTACLES

5-15. Survivability positions include fighting positions, protective positions (shelters), and trench-work connections. Such positions are usually constructed of earth and logs but may also be composed of man-made building materials such as concrete.

PLACEMENT

5-16. Properly occupying positions and placing obstacles are critical CCD considerations. When possible, place obstacles and occupy positions out of the direct view of threat forces (such as a reverse-slope defense), at night, or under conditions of limited visibility.

BACKGROUNDS

5-17. Select backgrounds that do not silhouette positions and obstacles or provide color contrast. Use shadows to hinder an enemy's detection efforts. If possible, place positions and obstacles under overhead cover, trees, or bushes or in any other dark area of the terrain. This technique prevents the disruption of terrain lines and hinders aerial detection. CCD efforts, however, should not hinder the integration of obstacles with fires.

5-18. When using the terrain's natural concealment properties, avoid isolated features that draw the enemy's attention. Do not construct positions directly on or near other clearly defined terrain features (tree lines, hedge rows, hill crests). Offsetting positions into tree lines or below hill crests avoids silhouetting against the background and also counters enemy fire.

NATURAL MATERIALS

5-19. Use natural materials to supplement artificial materials. Before constructing positions and obstacles, remove and save natural materials (turf, leaves, humus) for use in restoring the terrain's natural appearance for deception purposes. During excavation, collect spoil in carrying devices for careful disposal. When preparing survivability positions and obstacles—

- Avoid disturbing the natural look of surroundings. Use camouflage nets and natural vegetation to further distort the outline of a position, to hide the bottom of an open position or trench, and to mask spoil used as a parapet. To further avoid detection, replace natural materials regularly or when they wilt or change color.
- Consider the effect of backblasts from rocket launchers, missile systems, and antitank weapons. Construct a concealed open space to the position's rear to accommodate backblasts. A backblast area should not contain material that will readily burn or generate large dust signatures.
- Use natural materials to help conceal machine-gun emplacements. Machine guns are priority targets, and concealing them is an essential combat task. Although CCD is important, placement is the primary factor in concealing machine guns.

- Place mortars in defilade positions. Proper placement, coupled with the use of artificial and natural CCD materials, provides the maximum possible concealment. Also consider removable overhead concealment.
- Use decoy positions and phony obstacles to draw enemy attention away from actual survivability positions and traces of obstacle preparation. Decoys serve the additional function of drawing enemy fire, allowing easier targeting of an enemy's weapons systems.

BATTLE

5-20. CCD during the defensive battle is essentially the same as for the offensive battle. While a majority of the battle is normally fought from prepared, concealed positions, defensive forces still maneuver to prevent enemy breakthroughs or to counterattack. When maneuvering, units should—

- Adapt to the terrain.
- Make optimum use of concealed routes.
- Preselect and improve concealed routes to provide defensive forces with a maneuver advantage.
- Plan smoke operations to provide additional concealment for maneuvering forces.